

When Timing is Set in Stone

“Get in, get out and stay out” is the name of the game when it comes to major projects on busy highways. Repair and rehabilitation needs to be done as quickly as possible and last as long as possible. Engineers kept that in mind as they planned major repairs for a 1960s-era box girder bridge on Interstate 280 in San Francisco. It was the planning and preconstruction testing that made all the difference.

Project Description

Engineers had to decide whether to close the viaduct completely or to conduct their work in stages. Staged construction, which would have allowed constant, if partial, traffic flow could have taken 140 working days, put workers at risk, and caused serious traffic jams. They concluded it was better to completely close a portion of the viaduct and do an entire hinge during consecutive shifts, adding up to approximately 100 hours.

To minimize commuter disruption, the work was scheduled around three separate three-day holiday weekends: Memorial Day, Fourth of July, and Labor Day 2014. For each of the closures, work began on the day preceding the weekend and finished in the early morning hours of the day immediately following the weekend. Using lessons learned from the two earlier weekend closures, two hinges were done during the Labor Day weekend.

Unconventional Concrete

To stay within the 100-hour work window, the project development team proposed using Rapid Strength Concrete, in lieu of Portland Cement Concrete (PCC), to reconstruct the hinges. Rapid Strength Concrete could attain the design concrete strength in four hours, rather than the conventional 28 days for PCC, allowing the complete reconstruction of a hinge, from demolition to striping, within the 100-hour closure.

Rapid Strength Concrete was the solution for “getting in and getting out” during the extended holiday weekends. However, this project was the first time this type of concrete was used on a bridge application of this magnitude. The contractor was required to do a mock-up test before construction, simulating the entire concrete placement operation from material to forms to the equipment used, to ensure that the concrete would attain the design strength of 3,200 pounds per square inch in four hours.





There are always inherent risks associated with partial-bridge demolition and reconstruction, and there was great uncertainty during the first weekend closure, knowing that the structure had to be returned to traffic by 5 a.m. for the first commute day after the holiday weekend. The risks of demolishing a portion of a structure (10 feet on each side of the hinge was removed) were that the methods, equipment, and techniques used could damage the remaining portion of the bridge beyond repair. The contractor was required to submit a demolition plan that addressed these possibilities. There was also a danger that once the hinge was removed, the adjacent spans would be unloaded and sag, or worse, collapse. Temporary supports built before the demolition were the solution, and they were monitored and adjusted as needed during the entire process.

Based on research of archived “as-built” drawings it was found that some of the existing rebar that was to be spliced did not match contract drawings. Anticipating this, extra reinforcement of all sizes and extra mechanical couplers were brought on site along with a mechanical reinforcement bending table. Reinforcement cages for the hinge diaphragms were prefabricated. During the demolition and reconstruction, the structure was monitored and surveyed continuously at multiple locations for any lateral or vertical movement. Adjustments were made as necessary during demolition and prior to concrete placement.

Although the closures were scheduled during holiday weekends, there were still traffic impacts to consider. The public was notified weeks in advance of the weekend closures through changeable message signs and highway signs. Caltrans’ District 4 Bay Area office also effectively used traditional media outlets and social media to get out the message. Outreach to the communities resulted in no adverse reactions from the public during the weekend closures.

Lessons Learned

This project was a good example of intelligent risk taking. In the interest of the public and the project, the team collaborated to find solutions that were well thought out, carefully planned, tested, included back-up plans and contingencies, reduced costs, and increased safety. Every possibility was considered and countered to ensure the benefits gained in theory came to fruition in practice. Excellent partnerships with the City of San Francisco, the California Highway Patrol, Bay Area media groups, and the public translated into success for this project.

Source: Caltrans District 4